# Pragmatic Language Development in Young Children with ASD

Honors Research Thesis

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by

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**Abstract**

The purpose of this study was to examine the pragmatic impairments that exist in young children with Autism Spectrum Disorder. A measure adapted from Baron-Cohen, Surian, and Van der Lely (1996) called The Gricean Pragmatics test was used to evaluate how severe the pragmatic impairments were in the subjects with ASD, how their performance compared to their neurotypically-developing (NT) counterparts, if there were differences according to which Gricean Maxims were tested, and finally, if there were any underlying factors that contributed to pragmatic ability. The results showed that the children with ASD performed successfully on this task, possibly indicating that the majority of the children in this study had a less severe form of ASD. Furthermore, significant correlations were found between overall Grice scores and Peabody Picture Vocabulary Test, 4th Edition (PPVT-4) scores and also between overall Grice scores and digit span scores. These findings indicate that language ability and working memory play a role in overall Grice performance; possibly indicating that in general, children with higher IQs will perform better on the task.

# Pragmatic Language Development in Young Children with ASD

Pragmatics is an area of linguistics associated with the use of language and the variety of social contexts in which it is used; it is concerned with communicating to provide the listener with an accurate interpretation of the speaker's intentions and references (Berko-Gleason, 2005 in Philofsky & Hepburn, 2007). It is often called "the social aspect of language" because it includes social, emotional, and communicative behaviors employed during social interaction (Adams, Baxendale, Loyd & Aldredge, 2005; Martin & McDonald, 2003 in Philofsky & Hepburn, 2007). Pragmatics is an essential component of an individual's ability to communicate and interact with others. Philofsky & Hepburn (2007) refer to it as "form[ing] a critical intersection for children's developing language competencies and social interactions." Pragmatic development is a critical language skill for children to form meaningful relationships and friendships, and to obtain basic needs.

After evaluating the definition of pragmatics, the question presents itself: "What happens to those children who do not have typical pragmatic development?" This is the case of children with Autism Spectrum Disorder (ASD). Autism is described as a behaviorally diagnosed developmental disorder characterized by atypical deficits in social, communicative, and cognitive functioning (American Psychiatric Association, 2000 & Centers for Disease Control and Prevention, 2007 in Philofsky & Hepburn, 2007 & Baron-Cohen, 1996; Reichow, Salamack, Paul, Volkmar, & Klin, 2008; World Health Organisation, 1993 in Loukusa et al., 2006), and often includes restricted and repetitive patterns of behavior (Philofsky & Hepburn, 2007; American Psychiatric Association, 1994 in Reichow et al., 2008; World Health Organisation, 1993 in Loukusa et al., 2006). Further, children with ASD are characterized as having difficulties with pragmatics-related social skills, with communication, and with both expressive

and receptive language (Philofsky & Hepburn, 2007; Loukusa et al., 2006; Baron-Cohen, Surian, & Van der Lely, 1996).

In a study conducted by Philofsky & Hepburn (2007), children with ASD exhibited pragmatic difficulties with communication involving:

- unusual eye contact
- difficulties reading and expressing emotion in facial expressions
- difficulty understanding and using nonverbal gestures
- unusual prosody
- poor topic maintenance
- difficulty initiating social interactions with others
- decreased conversational reciprocity
- perseveration (response repetitions in inappropriate situations) with language
- difficulty maintaining topic coherence
- use of tangential language
- lack of interest in others
- difficulty forming friendships
- difficulty interpreting abstract language

Furthermore, there is a plethora of resources covering other difficulties including (but not limited to): egocentric speech (Cunningham, 1968 in Baron-Cohen et al., 1996), a failure to signal turn-taking (Bernard-Optiz, 1982 in Baron-Cohen et al., 1996), abnormal use of requests (e.g. asking questions for which they already know the answer; Wetherby & Prutting 1984; Baron-Cohen, 1988; Frith 1989; and Tager-Flusberg, 1989 in Baron-Cohen et al., 1996), and a failure to take into account the distinction between known and new information and conform to conversational rules (Ball, 1978; Baltaxe, 1977; Fine, Bartolucci, Szatmari, & Ginsberg, 1994 in Baron-Cohen et al., 1996). In contrast, in typical pragmatic development, very young children are able to understand the role of context in receptive and expressive language (Loukusa et al. 2006) and learn to take the listener's needs into account in conversation. Between five and nine years, children realize the importance of relevance and brevity in their conversations with others (Loukusa et al., 2006). In contrast to typically-developing children, the pragmatic impairments

exhibited in children with ASD are apparent. The number of children with ASD is growing. According to the Centers for disease control and prevention, one in every six children now has a developmental disorder such as ASD, learning disorders, or attention deficit/hyperactive disorder. Experts attribute this rise mainly to the increasing cases of ADHD and ASD, with the official occurrence of ASD now affecting 1 in every 110 individuals (2010). With the number of children indentified with ASD rising, the need for research is obvious. It is essential to identify difficulties children are experiencing, to quantify them, and to find if there are other factors that contribute to these impairments.

In 1989, Paul Grice published Studies in the Ways of Words. In this work, Grice introduced the outline of pragmatic conversational maxims of which this research examines. Grice proposed that there are certain maxims, or rules, that people should generally abide by in everyday, polite conversation. It was his hope "to conceive and begin to construct an ideal language, incorporating the formal devices, the sentences of which will be clear, determinate in truth value, and certifiable free from metaphysical implications…" (1989, p. 23). In summary, he wanted a pragmatically-efficient language.

An important concept to help with the understanding Grice's maxims is 'implicature.' In the *Logic and Conversation* section of his 1989 work, he discusses the complexity of pragmatic language, particularly the instances in which people say one thing, but are actually implying something different. In Grice's view, it is important to figure out what a person is implying in each utterance so that it can relate to the correct maxim, and also to ensure that there is not a violation of any maxim. Further, because the maxims are rules that govern what should be implied, how much should be implied, and what is unacceptable to imply, Grice also created the Cooperative Principle to help regulate conversational implicatures and maxims. For example:

"Make your conversational contributions such as is required, at the stage at which it occurs, by the accepted purpose of direction of the talk exchange in which you are engaged" (1989, pg. 26). This means that the two partners in the conversation are "co-operating towards an accepted purpose" (Baron-Cohen et al., 1996), and the maxims are helping them along the way to successfully achieve this goal.

The Cooperative Principle leads to four divisions of Grice's maxims; the first being Quantity, or how much information is included in each utterance, consists of two maxims:

1. "Make your contribution as informative as is required for the current purposes of the exchange"
2. "Do not make your contribution more informative than is required" (p.26)

An example violating this maxim is:

"*Who is your best friend*?"
"*My best friend is Peter. He wears clothes.*"[1]

The person asking the question did not expect the answer; he/she did not need to be told that Peter wears clothes. Because the individual answering the question added extra information that was already known or implied, he violated the maxim of Quantity.

The next category is Quality: the most important concept of Quality is the "*supermaxim*– Try to make your contribution one that is true" (1989, p. 27). Included in the Quality category are two maxims:

1. "Do not say what you believe to be false"
2. "Do not say that for which you lack adequate evidence"

An example violating this maxim would be "I saw the cat fly into the tree." Because cats cannot fly, this utterance is obviously false and violates the maxim of Quality.

The third division is that of Relation: "Be relevant". This maxim deals with the subject of conversation, and whether the speaker makes comments that are on or off topic. It also

1. Example of answer that violates the maxim was taken from Baron-Cohen, Surian, and Van der Lely (1996).

includes how to appropriately change the subject. An example violating this maxim would be as follows:

"*What did you do in art class today*?"
"*I have a field trip to the zoo next month*."

In the above example, the student changed the topic of conversation without first answering the question at hand, violating the maxim of Relation.

Grice's final category is Manner; this division relies upon *how* the message is presented, rather than upon *what* is said. Like Quality, Manner also has a supermaxim: "Be perspicuous" (Grice 1989, p. 27), more maxims in this category involving clarity include:

1. "Avoid obscurity of expression"
2. "Avoid ambiguity"
3. "Be brief (avoid unnecessary prolixity)"
4. "Be orderly"

Sentences that begin with "I'm not quite sure how to say this, but…" would violate the maxims of Manner because they add an unnecessary phrase to the beginning of a statement that the individual is making – so the person clearly does know how to say it.

Continuous violation of these maxims will result in ineffective communication. If the speaker does not understand the meaning or significance of the maxims and what is appropriate in conversation, he/she runs the risk of confusing or offending the listener. In addition, if a listener is unable to understand the implied aspects of conversation, he/she will not be able to comprehend what is happening in the exchange and may withdraw from it. Both of these cases where maxims are violated and communication is misinterpreted, can result from the pragmatic impairments of children with ASD.

To test the comprehension of these ideals, researchers Baron-Cohen, Surian, and Van der Lely (1996) created The Gricean Pragmatics Test, which will be used in this study. This test

involves the subject listening to a question with two answers, one of which violates a maxim. The participant's job is to decide which of the answers violates the Gricean maxim. An example is below:

Second Maxim of Quantity ("Avoid redundant information")

> 2 .1 [Examiner] : What did you have for breakfast ?
> T[om] : I had cornflakes, and then a boiled egg and toast.
> * J[ane] : A hard boiled egg cooked in hot water in a saucepan. (Baron-Cohen et al., 1996 p.70)

In this example Jane violated the maxim by offering extra information that is known to the listener; to boil an egg you must cook it in hot water that is in a saucepan. While these answers may sound overly precise, the children with ASD may not be able to understand this distinction.

Baron-Cohen et al. (1996) administered the test to three different groups of young children: typically developing children, those with specific language impairment (SLI), and those with ASD. They found that overall, while the typically-developing children and children with SLI performed above chance on the test, the children with ASD struggled with the task and performed at chance (p.63). There were, however, trends depending on which maxim was being tested. All children struggled with the maxims of Quantity, which Baron-Cohen et al. hypothesized may be age-related and not yet fully developed in all of the children (p. 65). Conversely, for the maxims of Quality and Relation, the children with ASD performed at chance, while the typically-developing children and those with SLI performed at ceiling (p.63). Because there were extra factors in Baron-Cohen et. al (1996) that played a role in how the children performed on the Grice task (age & false belief scores) , this study will test different factors to see how our subjects perform.

The other experiments in this study probed factors that can influence pragmatic development; the researchers wanted to find out if any of these characteristics significantly

affected performance of either diagnostic group. The first of these possible factors was age. In Baron-Cohen et al. (1996), age was found to play a significant role in the scores of all test groups (NT, ASD, & SLI) on questions of Quantity I and Quantity II. Although these maxims were not tested in the study at hand, the overall ages of the participants were significantly lower than those in Baron-Cohen et al. (1996). The current study examined whether age played a role in pragmatic development of the maxims for Quality and Relation.

The next factor tested was receptive language ability, measured by the Peabody Picture Vocabulary Test 4th edition (PPVT-4). Specifically, this test measures single word, concrete receptive vocabulary, or the ability to process the word that is said and select a correct representation of the word from a group. This task could relate to performance on the Grice task because the children need to understand words in pragmatic social interactions. The current study investigated whether children with high PPVT-4 scores (good receptive vocabulary) also have high overall Gricean scores, and vice-versa. In this task, the children were told, "point to" the target word in a set of four pictures. The PPVT-4 scores were used to determine if receptive language ability related to the Grice task.

Digit Span, known as Auditory Number Memory-Forward, is a "measure of a subject's immediate recall of rote nonsensical sequential auditory matter" (M. Gardner, 1996). It is a subtest of the Test of Auditory-Perceptual Skills-Revised (TAPS-R), which evaluates if a child has auditory-perceptual disabilities that can interfere with learning. The TAPS-R was used in this experiment to measure each subject's short-term memory, and to gauge whether short-term memory played a role in performance on The Gricean Pragmatics Test.

The final factor examined was "theory of mind." An article written by Happé & Frith (1994) defines theory of mind as "be[ing] able to attribute independent mental states to self and

others in order to explain and predict behaviour" (p. 116). This ability is not conscious, but rather is considered to be an innate cognitive mechanism that allows representation of others' mental states, and is absent in certain individuals (Happé & Frith, 1994). Because of the implications of this theory, it is widely studied in conjunction with typical and atypical child development. It is pertinent in studies of children with ASD because it may play a role in social interactions involving pragmatics. Happé and Frith (1994) use the term "mentalize" to describe the attribution of mental states and raise the point that to share attention and communicate successfully with an individual, one person must be able to understand what the other is thinking. This could explain why so many social interactions involving children with ASD fail; they do not realize what their communication partner is feeling or thinking, and fail to comprehend what is appropriate or inappropriate for that context. Existence of theory of mind is controversial because many researchers believe that individuals with ASD do not possess theory of mind; while others, (see Happé & Frithe, 1994), maintain that it does.

In the Baron-Cohen et al. (1996) study, the researchers concluded that passing theory of mind was indicative of successful performance on The Gricean Pragmatics test. In their study, they administered the "Sally Ann Test" (a false belief task) to each participant and found that children who passed this test scored above chance on the Grice task (three of eight subjects). In the current study, this task was adapted for the participants and materials available, but the methodology was the same. Due to the resolute correspondence between the false belief task and the Grice task found in Baron-Cohen et al. (1996), this study was interested in determining if the rule applied to a different group of participants.

Baron-Cohen et al. (1996) found that performance on the Gricean Pragmatics task was specific to diagnosis, and that performance on the false belief task was indicative of overall

Gricean performance. This would suggest that the severity of pragmatic difficulties in children with ASD may be linked to their theory of mind– if they are able to understand others' mental states, their pragmatic abilities are intact; if they cannot, their pragmatic abilities are impaired. The current research examines whether these findings hold true with a larger sample size. This study also examines if other factors (memory span & language ability) affect Gricean performance. Baron-Cohen et al. (1996) discussed these factors, but dismissed them as possible explanations for pragmatic impairment.

In addition to the queries listed above, this study investigated the following questions:

1. Could the children with ASD successfully complete The Gricean Pragmatics Test?
2. How the performance of the experimental group (children with ASD) compared to the performance of the control group (NT children).

## Methods

### *Participants*

Children with ASD ranging in age from 3;0 to 9;0 years participated in the study. Subjects were recruited through The Ohio State University's Medical Center. Parents who were interested in having their child participate had them diagnosed to determine if an ASD was present. Parents of 38 children were mailed letters about participation in the study and then called to set up appointments for testing. Eighteen children between the ages of 3;6 and 8;9 were recruited. Of these participants, five had invalid or incomplete results. Three participants refused to participate in the task and we were unable to obtain data. Two were excluded as a result of experimental error. During testing, a parent was allowed to sit in the testing room with

their child if necessary. Parents were instructed to refrain from cueing the child during testing. Tasks were filmed from behind a two-way mirror. If the parent chose not to sit in the testing room with the child, he/she sat in the filming room. Children spent 30 minutes to one hour in the testing room. Time for play or resting breaks were provided when the child appeared to be losing focus, became distracted by something else, seemed tired, or anxious. Most participants and their guardians chose not to take these breaks.

Neurotypically-developing children (NT) were also tested to provide a baseline of comparison. Thirteen participants were recruited through The Ohio State University. They ranged in age from 3;9 to 4;9. Of the thirteen NT participants recruited, only one had invalid results and was excluded from the study due to experimenter error. As with the participants in the ASD group, a parent was allowed to sit in the testing room to help the child to feel at ease and to encourage the child to focus on the tasks. Once again, the importance of refraining from giving the child cues during testing was explained to the parent before testing began.

***Materials***

The Gricean Pragmatics Test required few materials. There were two dolls named John and Tabitha, a computer with prerecorded answer sets for the dolls, and speakers to ensure that the child could hear what was being said. The experimental procedure (including all other tasks in the larger study) was recorded for coding purposes and required a video-camera, tapes, and a tri-pod. When the tapes were reviewed, a coding sheet was used to record which doll the child chose for each question.

To measure receptive language ability the Peabody Picture Vocabulary Test - 4$^{th}$ edition (PPVT-4) was used. For the digit span task, the record sheet for the Auditory Number Memory – Forward subtest of the Test of Auditory-Perceptual Skills-Revised (TAPS-R) was used.

Finally, materials for the false belief task included the doll named Tabitha (from the Grice task), two small plastic discs used for hiding places, and a small toy.

To obtain consent, the parents of the participants (both NT and ASD) were given a summary of procedures and possible outcomes. In addition, the parents were asked to sign a consent form for their child to participate in the study. The parents of children with ASD were also asked to sign a HIPAA release form to grant permission for the researchers to access the child's medical records in order to confirm a diagnosis of ASD. After the testing had been completed and the parents had been debriefed, the parents of the children with ASD were given ten dollars as compensation for allowing their child participate in the study. They were also given a parking pass.

***Procedures***

The focus of this study is one portion of a larger study. Consequently, there were several other tasks included in testing that will not be discussed in detail here.

The tests were administered by undergraduate and graduate students at The Ohio State University. To ensure reliability between the examiners, each was required to meet for training three times. Prior to the first session, the examiners were given DVD's of the testing procedures to watch and study. During the first training session, a doctoral student who previously ran the study went through the entire script of experimental procedures and demonstrated each task. Any questions that the trainees had were answered and a follow-up meeting was arranged. At the second meeting, the examiners-in-training were taught the consenting and debriefing process, were reminded how to administer each task, and were required to practice each task on another trainee. The third training session involved administering the tests to a typically-developing

child and watching the DVD of the testing to note any mistakes made or questions raised. Some examiners tested more than one NT child before moving on to the ASD participants of this study.

When the parent and child arrived at the testing center, they were welcomed and thanked for allowing their child to participate. Then, the consent was obtained. The parent was first given a laminated information sheet that explained in simple terminology what was going to happen during testing and what the experiment was about. In addition to the written summary, a brief verbal explanation was also provided. After giving the parent time to absorb this information, they were handed two copies of the consent form, one for our records and a copy for theirs. They were given time to look over the document and the examiner verbally explained the important points. After going through the consent form, the parent was given a HIPAA form to provide consent for the researchers to view the participant's medical records and confirm that their child did indeed have a diagnosis of ASD. A copy was offered to the parent, but most did not take the extra copy. After the proper paperwork was completed, we introduced the child to the testing room and began the examination.

The experiment began with standardized administration of the PPVT-4. The Test of Auditory Number Memory – Forward, or the digit span task, was administered next in standardized form.

The Gricean Pragmatics Test followed. The computer and speakers were hooked up and plugged in, and the sound files were opened before any of the tests had begun. The examiner would start out by introducing the child to the two dolls: "Here are some friends of mine. This is Tabitha and this is John." Then, the corresponding audio would be played and "Hi, I'm Tabitha! … Hi, I'm John!" would come out of the speakers. The rest of the directions were then explained to the child:

> "I am going to ask some questions to Tabitha and John, and they will always answer, but each time one of them will give silly answer. Sometimes Tabitha will say something silly and sometimes John will say something silly. I want you to point to the doll that said something silly. If you don't understand what the dolls say, let me know and I will repeat the question and their answers."

Six question and answer sets were presented to the child, with the experimenter shaking whichever doll was speaking to ensure the child knew who was speaking. The child was required to choose one doll for each set (*see Table 1)*. Testing was complete for this task when all of the questions/answers had been presented.

The final task was the test of false belief. The experimenter introduced the doll, Tabitha, once again to make sure that the child was familiar with her and then set the stage for the test: "This is Tabitha's favorite toy; she loves to play with it and wants to keep it safe while she takes a nap. She's going to hide in under this blue cover for when she wakes up." The experimenter would then aid the Tabitha doll in hiding her toy and explain to the child that Tabitha was going to go take a nap where she couldn't hear or see anything that they were doing. Then, the examiner would say to the child, "Let's switch the toy from under the blue cover to this white cover." After doing so, the examiner would wake Tabitha up and ask the child, "When Tabitha wakes up and wants to play with her toy, where is she going to look?" If the child pointed to the blue cover (the correct choice), the examiner would ask why they chose that cover. If the child pointed to the white cover (the incorrect choice), they would be asked if they remembered where Tabitha had put her candy. This task was completed after the child chose a cover and was asked a follow-up question.

***Table 1***

| The Gricean Pragmatics Test Script | | | |
|---|---|---|---|
| | ***Script:*** | ***Maxim Tested:*** | ****Target Answer:*** |
| 1 | Hey John and Tabitha, where do you live?<br>*Tabitha: I live on the moon.<br>John: I live in Ohio. | Quality | Tabitha |
| 2 | Hey John and Tabitha, have you seen my dog?<br>Tabitha: Yes, he is in the back yard.<br>*John: Yes, he is on the roof. | Quality | John |
| 3 | Hey John and Tabitha, why don't you play with me?<br>Tabitha: Because I have to go home for lunch.<br>*John: Because I am playing in the sky. | Quality | John |
| 4 | Hey John and Tabitha, what did you do on vacation?<br>Tabitha: I rode my bike every day.<br>*John: My pants were blue. | Relation | John |
| 5 | Hey John and Tabitha, what do you like to eat?<br>*Tabitha: I like the library.<br>John: I like ice cream. | Relation | Tabitha |
| 6 | Hey John and Tabitha, what games do you know?<br>Tabitha: I know how to play football.<br>*John: I know how old you are. | Relation | John |

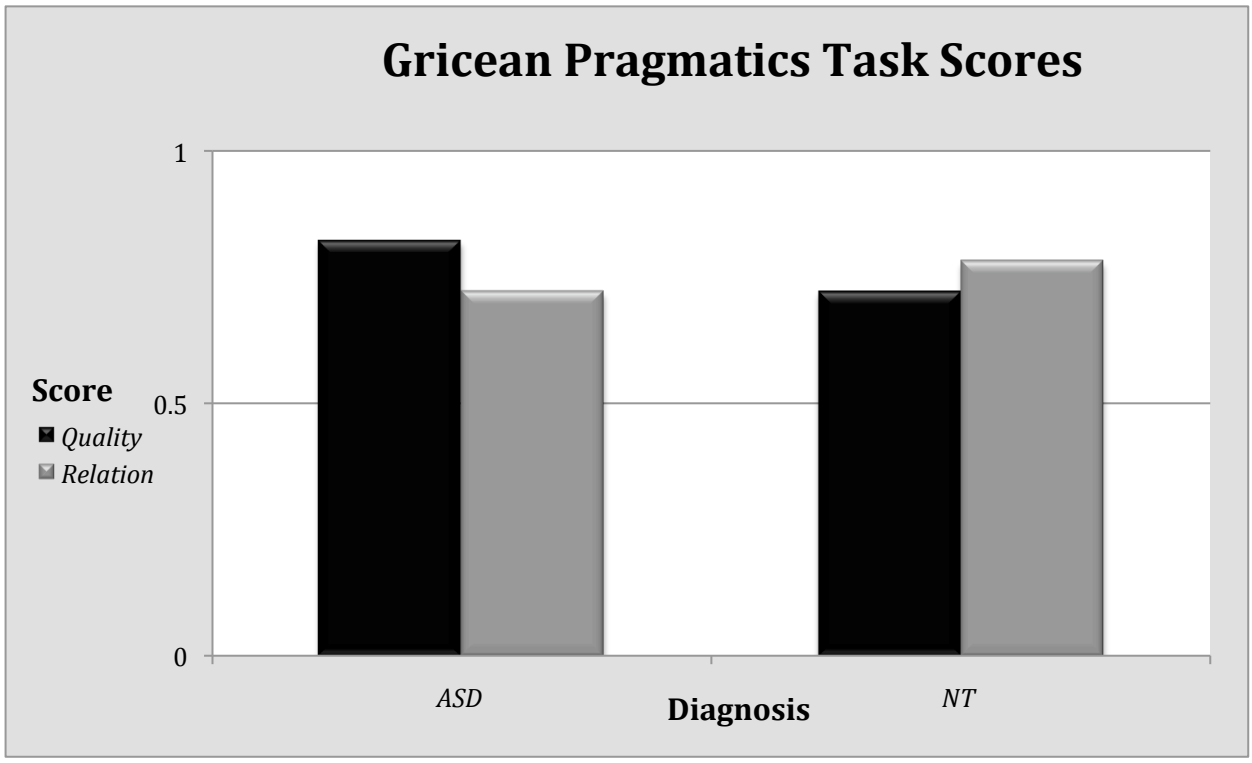
## Results

The first question this study posed was "Can the ASD children detect the target maxim violations on the Gricean Pragmatics test?" The mean overall score on this test for the subjects with ASD was $\bar{x}$= 0.77. A 1-Sample *t*-test was run to determine how the subjects scored compared to chance (0.50) and found $t(12) = 4.62$, $p < .001$, indicating that the children with ASD can successfully complete the task. Furthermore, this study sought to determine if the

children with ASD performed better on the questions concerning Quality or the questions concerning Relation. For the questions of Quality the children with ASD had a mean score of $\bar{x}$= 0.82, and for the questions of Relation, a mean score of $\bar{x}$= 0.72. A paired t-test was run to determine if Quality scores were significantly higher than Relation scores, and it found $t(12) = 1.45$, *n.s.*, showing that there is no significant difference between the two sets of scores.

The next important question of this study was "How do the children with ASD compare to the children who are typically-developing?" First, the mean overall score for the NT children was found; $\bar{x}$= 0.75. Then, a 1-Sample *t*-test was run to determine how they performed against chance (0.50), resulting in a value of $t(11) = 3.45$, $p < .005$, and confirming that the NT children were also able to perform successfully above chance on The Gricean Pragmatics Test. The scores for Quality ($\bar{x}$= 0.72) and for Relation ($\bar{x}$= 0.78) for this group were also compared using a paired *t*-test, and revealed no significant difference between the two scores ($t(11) = 0.50$, *n.s.*). Because there was no significant difference between the scores for Quality and Relation in either group, the rest of the calculations and findings focused on the overall Grice score. Scores for both groups can be seen in Table 2.

***Table 2***




These calculations led to the one question of the study: "Is there a difference between the scores of the children with ASD and the typically-developing children on The Gricean Pragmatics Test?" A one-way Analysis of Variance (ANOVA) was run with diagnosis as the independent variable and overall Grice score as the dependent variable to determine if significant differences existed between the two diagnostic groups. This resulted in a value of $F(1, 24) = 0.05$, *n.s.*, which reflects that there were no significant difference in performance between the two diagnostic groups. When the results showed that there was no significant difference in Grice scores between the NT participants and those with ASD, two 1-way ANOVAs were run. The first ANOVA used PPVT-4 scores as the dependent variable and diagnosis as the independent variable, yielding a significant value of $F(1, 24) = 5.04$, $p < 0.05$. In combination with the mean scores for both diagnostic groups (ASD: $\bar{x}= 104.23$, NT: $\bar{x}= 119.58$), this value indicates that the NT participants had significantly higher PPVT-4 scores than the ASD participants. The second

ANOVA used digit span scores (ASD: $\bar{x}$= 95.50, NT: $\bar{x}$= 106.00) for the dependent variable and diagnosis for the independent variable. This calculation produced a value of $F(1, 24) = 3.06$, *n.s.*. While statistically, this number indicates that there are no significant differences between the digit span scores of the different groups, it produced a significance value of 0.097, which trends towards the NT children being significantly better. Because the NT participants had, for the most part, significantly higher language and memory abilities than the participants with ASD, they were a poor control group for observing differences between diagnoses. As with Relation and Quality, because there were no significant differences between the performances on the Grice task for the diagnostic groups, they were considered one group for the rest of the calculations.

Finally, this study wanted to see if there were any underlying abilities that aid in pragmatic ability when present and exacerbate the pragmatic impairment when absent. First, participant means were calculated for all factors, and are displayed in Table 3.

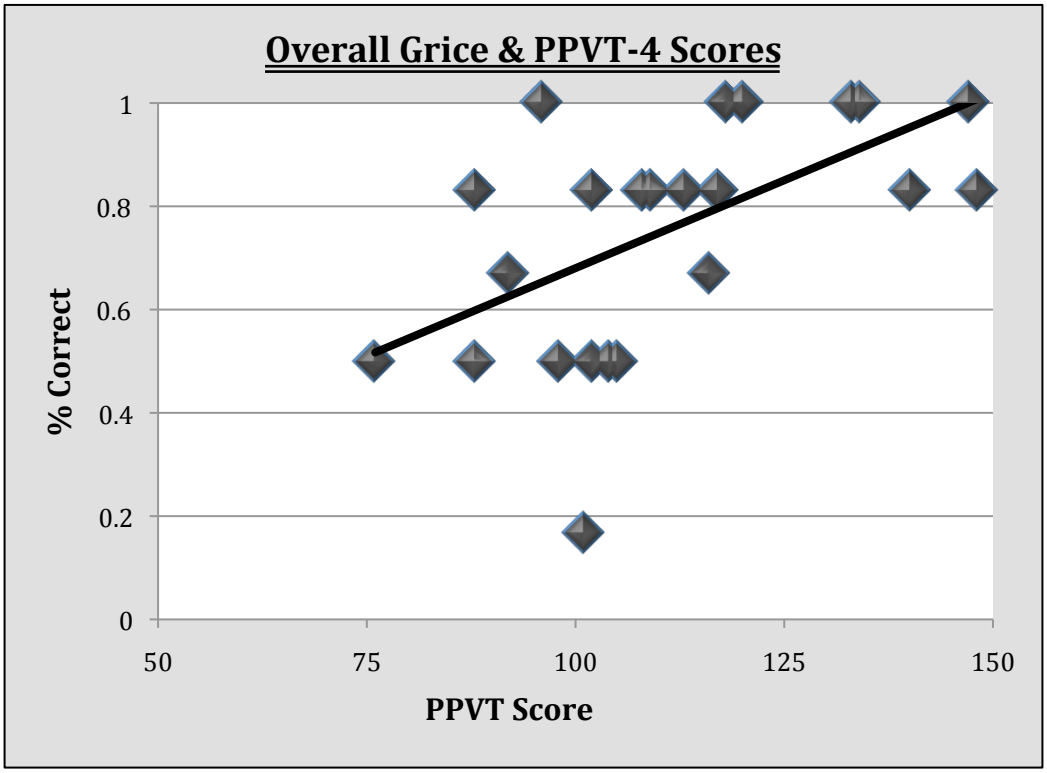
***Table 3***

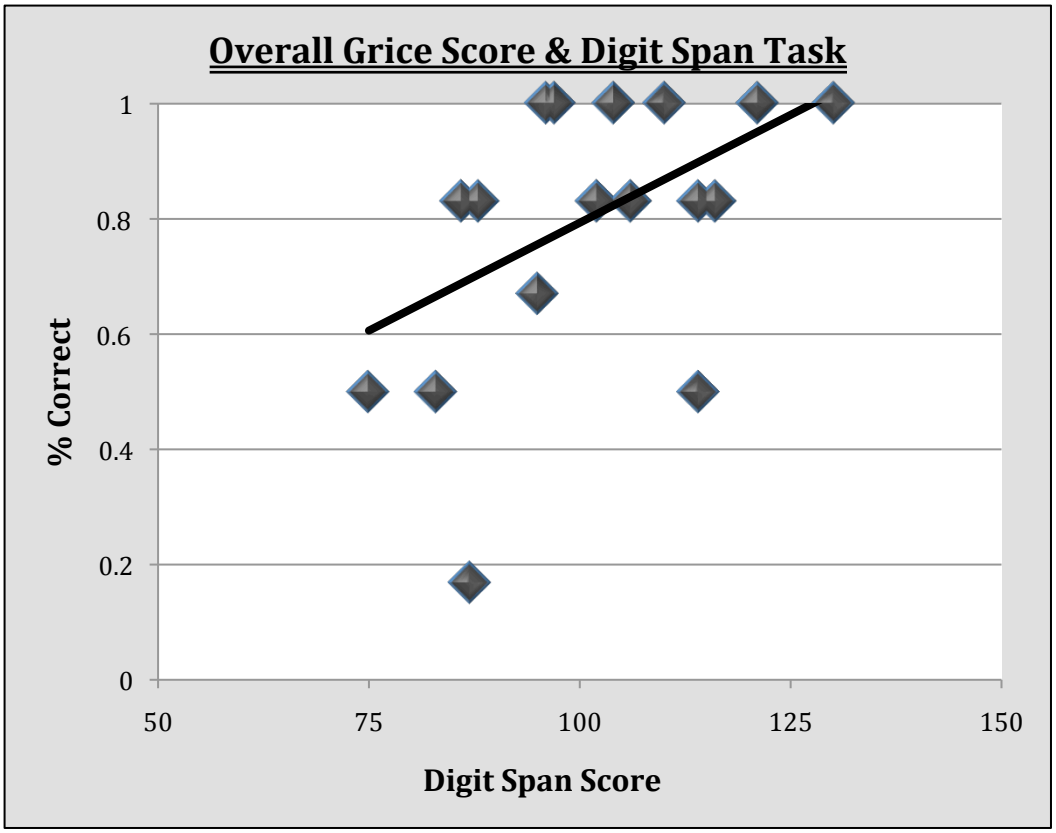
**Participant Means & Standard Deviations**

| | ASD (N=13) | NT (N=12) |
|---|---|---|
| **Age** | 5.42, 1.58 | 4.19, 0.28 |
| **PPVT-4 Standard Score** | 104.23, 14.00 | 119.58, 19.92 |
| **Digit Span Standard Score*** | 95.50, 15.72 | 106.00, 10.65 |
| **False Belief Score**** | 0.54, | 0.54 |
| **Overall Grice Score** | 0.77, 0.21 | 0.75, 0.25 |
| **Quality Alone Score** | 0.82, 0.26 | 0.72, 0.34 |
| **Relation Alone Score** | 0.72, 0.23 | 0.78, 0.30 |

**Children under 4 years were not scored for this task*
***Standard Deviation not relevant (yes/no question)*

An ANOVA was run to discern if the scores on the test of false belief (measures theory of mind), were significantly indicative of The Gricean Pragmatics Test scores. This resulted in a value of $F(1, 24) = 0.05$, *n.s.*, indicating that no significant relationship exists between false belief scores and overall Grice scores. To test the other underlying factors, a bivariate correlation was run with age, digit span score, PPVT-4 score, and overall Grice score as the variables. Significant correlations were found between overall Grice scores and PPVT-4 scores ($r^2 = 0.56$, $p < 0.01$), and also between overall Grice scores and digit span scores ($r^2 = 0.47$, $p < 0.05$). These correlations can be seen in the following graphs.






**Discussion**

The purpose of this study was to find what pragmatic difficulties the children with ASD are experiencing, to quantify them, and to find if there are other factors that contribute to these impairments. The Gricean Pragmatics Test was used to measure these pragmatic impairments; it was given to determine if the children with ASD realize when an utterance is pragmatically incorrect in the speech of others. This study also examined if factors such as age, diagnosis, memory, language ability, and theory of mind contribute to the pragmatic difficulties experienced by children with ASD (as shown by scores on the Gricean Pragmatics test).

These results differed from the Baron-Cohen et al. (1996) study. In their work, they found that the children with ASD underperformed both the group of typically-developing children and the group of children with SLI. In the current study there was no significant

difference between the scores of the typically-developing children and the children with ASD. Part of this finding could be attributable to the significant differences found between the groups' PPVT-4 and digit span scores. In both tasks, the NT participants outperformed the children with ASD, giving us an unclear picture of how the two diagnostic groups actually performed in comparison to one another. These differences, however, could not account for the finding that the participants with ASD did surprisingly well on the task, indicating that they *do* understand when something pragmatically incorrect is said.

Baron-Cohen et al. maintained that successful performance on the Gricean task was linked to the ability to attribute others' mental states, or theory of mind. They tested their theory using a very similar false belief task to what was used in the current study and found that the association between the tasks was significant. In the current study, the researchers found no reason to believe that theory of mind contributed to the performance of the children on this task. The calculations done between false belief scores and overall performance on the Gricean task did not produce a significant value. A possible explanation for these contradictory results is that the current study contained children with a less severe form of ASD. In the current study, seven of the thirteen participants with ASD passed the false belief task, and of those, four had a diagnosis of PDD-NOS. In fact, all of the participants classified as PDD-NOS passed this task. Upon further examination of other test scores, these children have higher scores on measures such as the PPVT-4 and digit span, than the participants who did not pass the false belief task.

The above argument that the children with ASD in this study may have a less severe form of the disorder than those in Baron-Cohen et al. (1996), could also explain why our participants performed more successfully on the Grice task than did the children with ASD in their study. If the children with ASD have a more mild form, or are better at managing their symptoms, they

will do better on the tasks administered. Because Autism is a spectrum disorder, considerable variability exists from one child to the next. It could be that in this study, more children were recruited with less severe pragmatic impairments. Also, several participants were excluded from the study because they simply did not participate in the tasks. These children may have a more severe form of the disorder, leaving the children with less severe impairments for data analysis. If the study were repeated it would be interesting to see how the results would turn out if severity of diagnosis was controlled.

Other significant findings in this study are the correlations between overall Grice scores and PPVT-4 scores, and also overall Grice scores and digit span scores. It is very probable that these factors are indicative of one another. Children with better vocabularies (high PPVT-4 scores) may perform better on the Grice task because they are less likely to run into an unfamiliar word, and more likely to understand sentences in their entirety. Digit span may be indicative of Grice performance because children need to be able to remember what was said in the Grice script while determining which answer relates to the question at hand.

Perhaps an overall Grice score isn't necessarily indicative of pragmatic ability in young children, but rather of IQ in general. According to Neisser et. al (1995), while there is no set definition for what defines IQ, many tests involve spatial and quantitative abilities; verbal abilities; and memory. Because of this definition and the correlation of these factors with overall Grice performance, the hypothesis can be made that children with high IQs will be more successful on the Gricean Pragmatics test. Furthermore, this goes along with the idea that the participants with ASD in this study had a more mild form of the disorder, and thus, likely higher IQ's.

A limitation of the current study was the fact that the children might not understand the task. In the Baron-Cohen study, a control task was given to the participants that scored at chance. This task employed the same methodology as The Gricean Pragmatics Test and the children were given the same instructions (point to the doll who said something silly). In this control task, however, instead of testing the child on only questions involving pragmatic violations, they were also tested on questions involving inverted syntax and grammatical violations. If the child was able to perform successfully on the control task, it was implied that they also understood the directions for the experimental Grice task, but performed unsuccessfully. If the current study were continued, it would be necessary to implement a control task such as the one above because many times the children being tested seemed like they did not understand the task or they were not interested in performing the task. The control task would assist in creating a stronger data set with higher validity than what exists in the current study. It is possible that it could have also helped the children who were excluded from the study to better understand the task, providing more results of children with varying levels of severity in this group of participants.

If the study is continued, another element that would be useful involves asking the child, after they point to the doll that said something silly, why they chose that answer or how they knew that answer was silly (Loukusa et al., 2006). This would give researchers a better understanding of how each child is thinking, and clues as to whether intelligence or pragmatic ability is responsible for scores on The Gricean Pragmatics Test.

In conclusion, the finding that the children with ASD did surprisingly well on The Gricean Pragmatics Test could be explained by the majority of participants had a less severe form of the disorder. Further, this would also explain why there was no significant difference

between the diagnostic group and their NT counterparts. If the children's level of severity is mild, they may not experience all of the difficulties that distinguish them from typically-developing children. This theory can also explain the correlations of overall Grice scores with PPVT-4 and digit span scores, and the idea that these are indicative of IQ; if the child has a less severe form of ASD they probably have a higher IQ than those with severe impairments. If this is the case, it would explain the success of the children with ASD in this study that was not found in previous research.

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